भारतीय मानक
Indian Standard

IS 16630 (Part 1) : 2018

प्लास्टिक — उपभोक्ता से उपभोग के बाद प्राप्त पोली (इथाइलीन टेरेफ्थैलेट) (पीईटी) बोतल पुनःचक्रित

भाग 1 अभिमान प्रणाली तथा विशिष्टि का आधार

Plastics — Post-Consumer Poly (Ethylene Terephthalate) (PET) Bottle Recyclates

Part 1 Designation System and Basis for Specifications

ICS 83.080.20

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Plastics Sectional Committee, PCD 12

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

While making this standard, considerable assistance has been derived from ISO 12418-1 : 2012 ‘Plastics — Post-consumer poly (ethylene terephthalate) (PET) bottle recyclates — Part 1: Designation system and basis for specifications’.

This standard is prepared in line with the Plastic Waste Management Rules, 2016 which states that carry bags made of recycled plastic or products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink food stuff. Thus, this standard does not cover PET recyclates application for food packaging.

Indian Standard

PLASTICS — POST-CONSUMER POLY (ETHYLENE TEREPHTHALATE) (PET) BOTTLE RECYCLATES

PART 1 DESIGNATION SYSTEM AND BASIS FOR SPECIFICATIONS

1 SCOPE

1.1 This standard establishes a designation system for post-consumer poly (ethylene terephthalate) (PET) bottle recyclates, which may be used as the basis for specifications.

1.2 The types of PET bottle recyclate are differentiated from each other by a classification system based on appropriate levels of the following designatory properties:

a) intrinsic viscosity (IV);
b) levels of contamination due to the label and other visible contaminants, PVC and polyolfins(and including adhesive);
c) water content; and
d) bulk density.

Information regarding the intended application or method of processing will also assist in classification.

1.3 This standard is applicable to all PET bottle recyclates. It applies to material ready for normal use in the form of powder, flakes or pellets.

1.4 It is not intended to imply that materials having the same designation will give the same performance. This part of standard does not provide engineering data or data on processing conditions which might be required to specify a material for a particular application and/or method of processing.

If such additional details are required, they shall be determined in accordance with the test methods specified in Part 2 of this standard, if suitable.

1.5 In order to specify a thermoplastic material for a particular application or to ensure reproducible processing, additional requirements may be given in data block 5 (*see* **3.1**)

2 REFERENCES

The Indian Standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

IS No.	*Title*
14534 : 2016	Plastics — Guidelines for the recovery and recycling of plastics waste
16630 (Part 2) : 2017	Plastics — Post-consumer poly (ethylene terephthalate) (PET) bottle recyclates : Part 2 Preparation of test specimens and determination of properties

3 DESIGNATION SYSTEM

3.1 General

The designation system for thermoplastics is based on the following standardized pattern:

<table>
<tr><th colspan="7">Designation</th></tr>
<tr><td rowspan="3">Description Block (optional)</td><th colspan="6">Identity Block</th></tr>
<tr><td rowspan="2">Indian Standard Number Block</td><th colspan="5">Individual-Item Block</th></tr>
<tr><td>Data Block 1</td><td>Data Block 2</td><td>Data Block 3</td><td>Data Block 4</td><td>Data Block 5</td></tr>
</table>

The designation consists of an optional description block, reading “Thermoplastics”, and an identity block comprising Indian Standard number and an individual-item block. For unambiguous designation, the individual-item block is sub-divided into five data blocks comprising the following information:

Data block 1: Position 1: Identification of the plastic by its abbreviated term (PET) (*see* **3.2.1**).

Position 2: The recycling process used (*see* **3.2.2**).

Position 3: The form of the products (*see* **3.2.3**).

Position 4: For products in flake or pellet form, the size of the flakes or pellets (*see* **3.2.4**).

Position 5: The filter opening used in the case of pellet extrusion (*see* **3.2.5**).

Data block 2: Filler or reinforcing material, its form and its content in the recyclate (*see* **3.3**).

Data block 3: Position 1: Intended application and/or method of processing (*see* **3.4**).

Position 2: Whether coloured or natural (*see* **3.4**).

Data block 4: Designatory properties (*see* **3.5**).

Data block 5: For the purpose of specifications, a fifth data block containing additional information may be added (*see* **3.6**).

The first character of the individual-item block shall be a hyphen.

The data blocks shall be separated from each other by a comma.

If a data block is not used, this shall be indicated by doubling the separation sign, that is, by two commas(,,).

3.2 Data Block 1

3.2.1 *General*

In this data block, after the hyphen, poly (ethylene terephthalate) plastics are identified in position 1 by the symbol “PET”. Then, in positions 2 to 5 (*see* **3.2.2** to **3.2.5**), information about the recycling process and the form of the product is given. The code-letters and code-numbers used are specified in Table 1.

3.2.2 *Recycling Process*

In position 2 of this data block, the recycling process is represented by code-letters in parentheses, as follows:

a) (MRG) for general mechanical recycling, the meaning of mechanical recycling being as defined in IS 14534;
b) (MRA) for mechanical recycling plus treatment with alkali; and
c) (MRP) for mechanical recycling plus treatment other than treatment with alkali, such as solid- phase polymerization or vacuum evaporation.

3.2.3 *Product Form*

In position 3 of this data block, the form of the product is represented by a code-letter, F, P or W.

3.2.4 *Size of Flakes or Pellets in Product*

In position 4 of this data block, the size of the flakes

Table 1 Code-Letters and Code-Numbers Used in Data Block 1
(*Clause* 3.2.1)

Position 2		Position 3		Position 4			Position 5	
Code-Letters	Recycling Process	Code-Letters	Product Form	Code-Letters	Flake Size[2] (mm)	Pellet Size[3] (mm)	Code-number	Filter Opening (µm)
(MRG)	General mechanical recycling	F	Flakes	S	≤ 5	≤ 2	35	≤ 35
(MRA)	Mechanical recycling + treatment with alkali	P	Pellets	M	≥5 but < 10	>2 but <5	99	>35
(MRP)[1]	Mechanical recycling + other treatment[4]	W	Powder	L	≥10	≥5		

[1] Solid-phase polymerization or vacuum evaporation treatment is a suitable additional process for MRP.

[2] Flake size is given by the sieve mesh opening of the grinder.

[3] Pellet size is given by the die opening in the die opening in the pelletizer and measured using a ruler or calipers.

[4] In addition to the usual mechanical recycling process, one or more physical and/or chemical processes, other than treatment with alkali, are used to improve the purity.

or pellets making up the product is represented by a code-letter, S, M or L.

3.2.5 *Filter Opening*

In position 5 of this data block, the filter opening in the case of pellet extrusion is represented by a two-figure code-number.

3.3 Data Block 2

In this data block, the type of filler and/or reinforcing material is normally represented by a single code-letter in position 1 and its physical form by a second code-letter in position 2. Subsequently (without a space), the mass content may be given by a two-figure code-number. In the case of general PET bottle recyclates, however, it is not permitted to add filler and/or reinforcing material intentionally. The recyclate content may be given by the code-letter R followed, without a space, by the mass content, the whole being placed between parentheses. For example, the fact that the PET contains no filler but 100 percent of recycled material would be indicated by (R100).

3.4 Data Block 3

In this data block, information about the intended application and/or method of processing is given in position 1. Information of whether the product is coloured or natural is indicated in position 2. The code-letter used are specified in Table 2. If no specific information is indicated, the letter X, depending on the position, shall be inserted (*see* Table 2).

3.5 Data Block 4

3.5.1 *General*

In this data block, the range of intrinsic viscosity (IV) is represented by a code-letter/number combination in position 1, the level of contamination due to the label and other visible contaminants by a code-letter/number combination in position 2, the level of contamination due to PVC by a code-letter/number combination position 3, the level of contamination due to polyolefins (and including adhesive) by a code-letter/number combination in position 4, the water content by a code/letter/number combination in position 5 and the bulk density by a code/letter/number combination in position 6. The code/letter/number combinations used are specified in Table 3.

Table 2 Code-Letters Used in Data Block 3

(*Clause* 3.4)

Position 1		**Position 2**	
Code-Letter	**Intended Method of Processing**	**Code-Letter**	**Colour**
B	Blow moulding or injection moulding	C	Coloured
E	Extrusion of films or sheets	N	Natural (no colour added)
F	Fibre	–	–
X	No indication	X	No indication

If a property value falls on or near a range limit, the manufacturer shall state which range will designate the material. If subsequent individual test values lie on, or either side of, the limit because of manufacturing tolerances, the designation is not affected.

NOTE — Not all combinations of the values of the designatory properties are provided by currently available polymers.

Table 3 Code-Letters/Numbers Used in Data Block 4

(*Clause* 3.5.1)

Position 1		**Position 2**		**Position 3**		**Position 4**		**Position 5**		**Position 6**	
		Contamination Level (only for Flakes) mg/kg									
Code	**Intrinsic Viscosity** dl/g	**Code**	**Label and Similar**	**Code**	**PVC**	**Code**	**Poly-olefins**	**Code**	**Water Content** percent	**Code**	**Bulk Density** kg/m^3
IV10	≥ 1.0	L02	≤ 20	V02	≤ 20	O02	≤ 20	W1	≤ 1.0	D1	≥ 400
IV08	≥0.8 but <1.0	L10	>20 but ≤ 100	V10	>20 but≤100	O10	>20 but ≤100	W2	>1.0 but <1.5	D2	> 300 but < 400
IV07	≥0.7 but <0.8	L30	>100 but ≤ 300	V30	>100 but ≤300	O30	>100 but ≤300	W9	≥ 1.5	D9	≤ 300
IV06	≥0.6 but <0.7	L99	> 300	V99	> 300	O99	> 300				
IV00	<0.6										

3.5.2 *Intrinsic Viscosity*

The intrinsic viscosity (IV) shall be determined either in accordance with the method given in Table 1 of IS 16630 (Part 2) or from the melt volume-flow rate (MVR) determined in accordance with Annex C of IS 16630 (Part 2), using the conversion equation given in that Annex.

The possible values of the intrinsic viscosity are divided into five ranges, each represented by a code-letter/number combination as specified in Table 3.

3.5.3 *Contamination Due to the Label Other Visible Contaminants, PVC and Polyolefin*

The level of contamination due to the label and other visible contaminants, PVC and polyolefins (including adhesive) shall be determined in accordance with IS 16630 (Part 2).

The possible contamination levels are divided into four ranges, each represented by a code-letter/number combination as specified in Table 3.

3.5.4 *Water Content*

The water content shall be determined in accordance with IS 16630 (Part 2).

3.5.5 *Bulk Density*

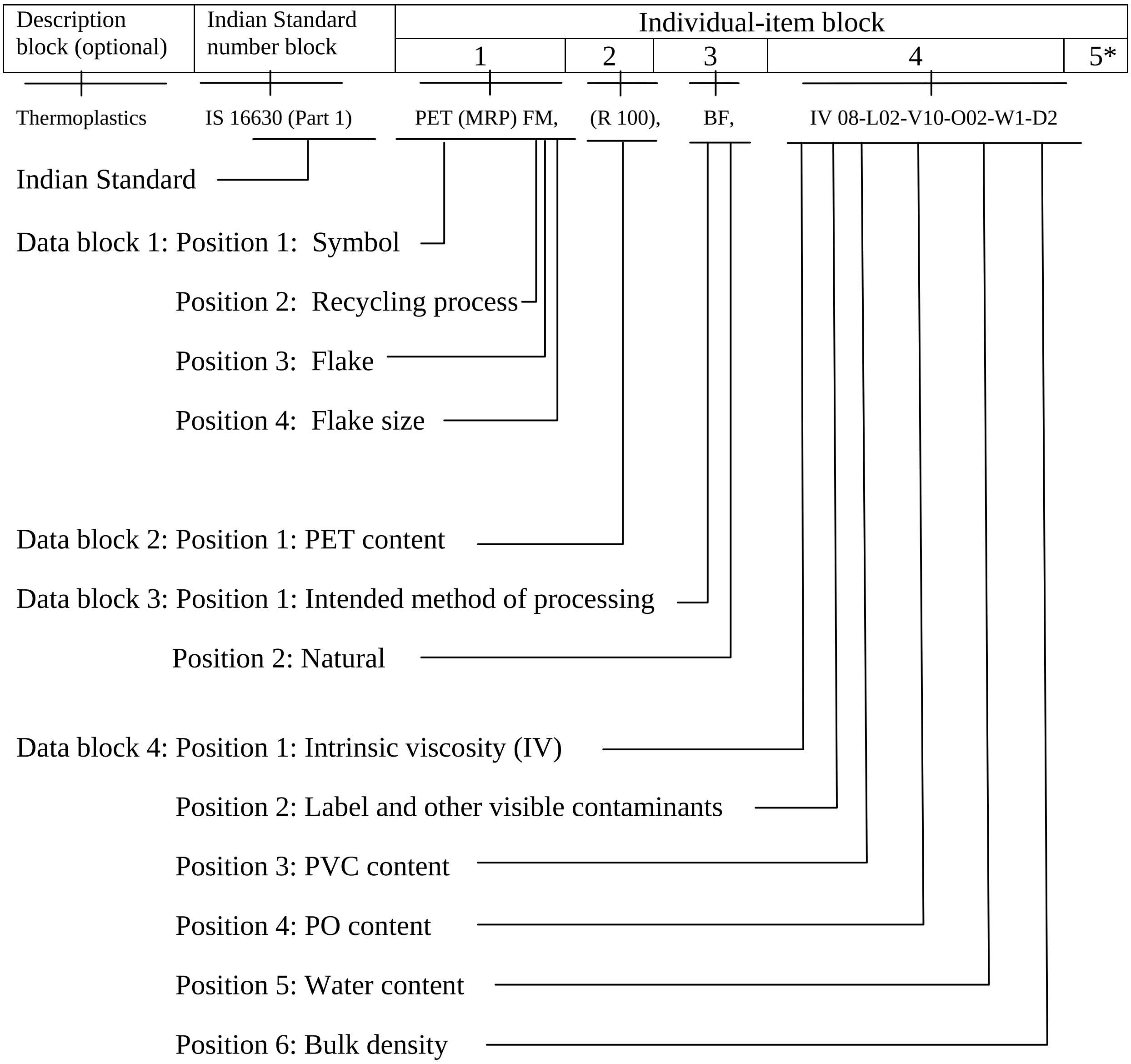
The bulk density shall be determined in accordance with IS 16630 (Part 2).

3.6 Data Block 5

Indication of additional requirements in this optional data block is a way or transforming the designation of a material into a specification for a particular application. This may be done for example by reference to a suitable national standard or to a standard-like generally established specification.

4 EXAMPLE OF A DESIGNATION

APET bottle recyclate (recycle rate 100 percent) recycled by mechanical recycling plus treatment other than treatment with alkali [(MRP)], in the form flakes (F) of size 7mm (M), without filler [(R100)], intended for blow moulding (B), natural (N), intrinsic viscosity 0.85 dl/g (IV08), contamination due to the label and other visible contaminants 15 mg/kg (L02), contamination due to PVC 30 mg/kg (V10), contamination due to polyolefins to mg/kg (O02), water conten 0.5percent (W1) and bulk density 305 kg/m^3 (D2).



Description block (optional)	Indian Standard number block	Individual-item block				
		1	2	3	4	5*
Thermoplastics	IS 16630 (Part 1)	PET (MRP) FM,	(R 100),	BF,	IV 08-L02-V10-O02-W1-D2	

Indian Standard

Data block 1: Position 1: Symbol

Position 2: Recycling process

Position 3: Flake

Position 4: Flake size

Data block 2: Position 1: PET content

Data block 3: Position 1: Intended method of processing

Position 2: Natural

Data block 4: Position 1: Intrinsic viscosity (IV)

Position 2: Label and other visible contaminants

Position 3: PVC content

Position 4: PO content

Position 5: Water content

Position 6: Bulk density

*Data block 5: Not used

Designation: IS 16630 PET (MRP)FM(R100),BF,IV08-L02-V10-O02-W1-D2

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